Tribal Surface Water Monitoring Quality Assurance Project Plan

Aroostook Band of Micmacs

Prepared by David Macek, Aroostook Band of Micmacs Environmental Health Department
8 Northern Road, Presque Isle, Maine (207) 764-1792

May 13, 1999

Tribal Surface Water Monitoring Project Manager: ______ Signature/Date
David Macek, Aroostook Band of Micmacs Environmental Health Department

Tribal Surface Water Monitoring QA Officer: ______ Signature/Date
Fred Corey, Aroostook Band of Micmacs Environmental Health Department

Approval Signature: ______ Signature

William Nuzzo ______ Printed Name/Title/Date

U.S. EPA Region 1 Project Manager ______ Approval Authority

Approval Signature: 22-99 ______ Signature

Art Clark for *Nancy Barmakian* ARTHUR E. CLARK ______ Printed Name/Title/Date

U.S. EPA Region 1 QAM ______ Approval Authority

3.0 DISTRIBUTION LIST AND PROJECT PERSONNEL SIGN-OFF SHEET

DISTRIBUTION LIST

QAPP Recipients	Title	Organization	Telephone Number
Fred Corey	Environmental Program Director	Aroostook Band of Micmacs	(207) 764-7219
David Macek	Environmental Specialist	Aroostook Band of Micmacs	(207) 764-7219
Nick Archer	Environmental Specialist	Maine DEP, Bureau of Water Quality	(207) 764-0477
David Miller		Maine DEP	(207) 287-6134

PROJECT PERSONNEL SIGN-OFF SHEET

<u>Organization: Aroostook Band of Micmacs</u>

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read	QAPP Acceptable as Written
Fred Corey	Environmental Program Director	(207) 764-7219	Fred Corey	07/13/99	yes
David Macek	Environmental Specialist	(207) 764-7219	David Macek	7/13/99	yes
Nick Archer	Environmental Specialist	(207) 764-0477			
David Miller		(207) 287-6134			

4.0 PROJECT ORGANIZATION

COMMUNICATION PATHWAYS AND TASKS

Figure 4-1 shows the project organization for the Tribal surface water studies and its principal lines of communication.

The Project Manager/Field Supervisor *(David Macek)* oversees project management, directs field data collecting activities, and will communicate daily with the Technical Director/QA Officer *(Fred Corey)* verbally, and when necessary with documented memos in regards to all aspects of the project (i.e., quality control, data collection documentation, analysis and assessment etc.). The Project Manager/Field Supervisor *(David Macek)* will provide a report, to the Technical Director/QA Officer *(Fred Corey)* monthly, with a summary of work and the resulting data. Additionally, the Project Manager/Field Supervisor *(David Macek)* will provide information (subject to Tribal approval) to any agency wishing to acquire data/reports/results in regards to the project.

The Technical Director/QA Officer *(Fred Corey)* oversees project QA/QC activities, provides technical advise, and will be responsible for communicating information regarding the project to the appropriate agencies within the Aroostook Band of Micmac Tribe and to the Tribal Council. Additionally, the Technical Director/QA Officer *(Fred Corey)* will be responsible for communication in regards to all aspects of the project with the appropriate EPA authority.

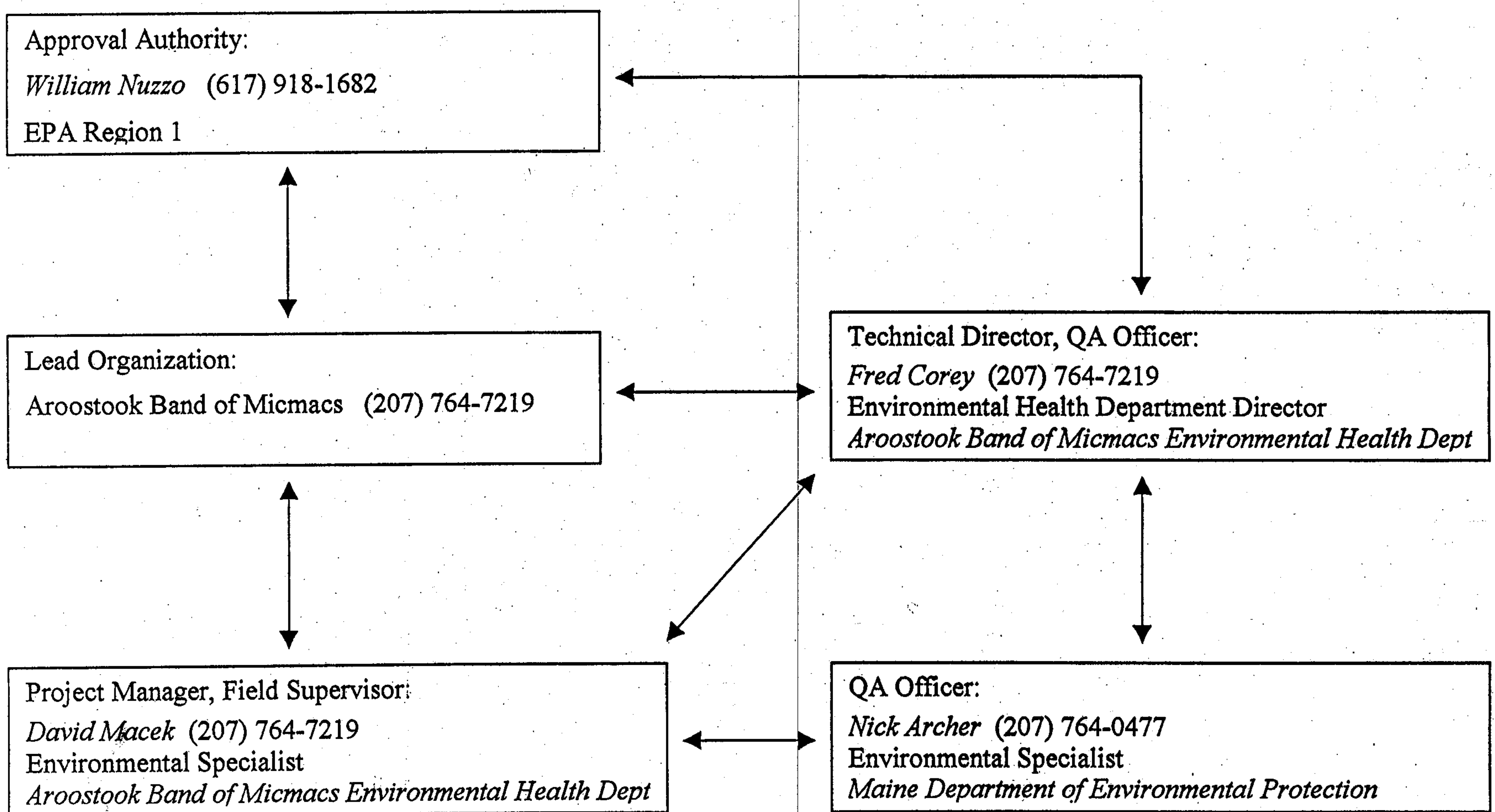
QA Officer *(Nick Archer)* Assists with QA, and will provide field technical systems audits.

MODIFICATIONS TO APPROVED QAPP

In general, any member of the project staff who detects or suspects nonconformance to previously established criteria or protocol in equipment, instruments, data, methods, etc., will immediately notify the Project Manager in writing. The written communication will identify the condition and explain how it may affect data quality. The Project Manager will conduct an investigation to determine the severity and extent of the problem and determine appropriate corrective actions.

All modifications to the QAPP will be documented and submitted for approval in the same manner as the original QAPP. Initial verbal approval will be sought in order to expedite project work; however, the QAPP modification will be documented immediately and submitted for formal approval. The modification will be distributed to all QAPP recipients to be included as an attachment to the original QAPP, and as soon as possible, will be incorporated into the final QAPP revision.

FIGURE 4-1. ORGANIZATIONAL CHART



5.0 PROJECT PLANNING/PROBLEM DEFINITION

PROJECT PLANNING MEETINGS (SCOPING MEETINGS) ATTENDANCE SHEET

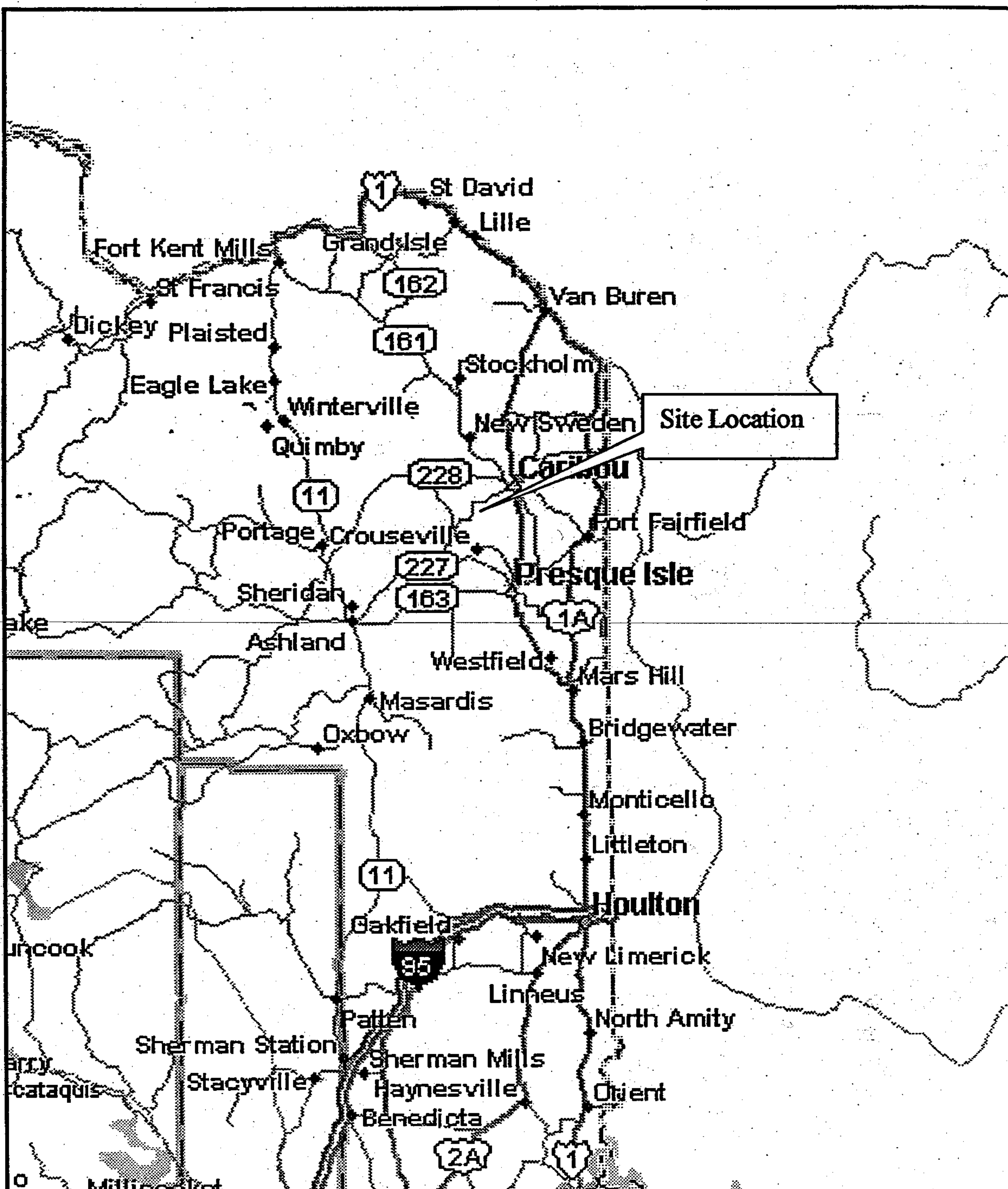
Hardwood & Glidden Brook Baseline Monitoring Presque Isle/Caribou ME David Macek				
Date of Meeting: 02/01/99				
Name	**Title**	**Affiliation**	**Phone**	**Project Role**
Fred Corey	Environmental Program Director	Aroostook Band of Micmacs	(207) 764-7219	Oversees project QA/QC activities, gives technical advise
David Macek	Environmental Specialist	Aroostook band of Micmacs	(207) 764-7219	Oversees project management, directs field activities.
Meeting Purpose: To discuss suspected surface water conditions, project funding, and with the funding available, what baseline parameters would be most useful to begin monitoring.				

PROBLEM DEFINITION/SITE HISTORY AND BACKGROUND

The Aroostook Band of Micmacs Indian Tribe is developing a water quality program with funding from the U.S. EPA Clean Water Act Section 104(b)(3) Water Quality Grant. The purpose for collecting data is to support the Tribe's long-range goals of developing Tribal rules, regulations, and water quality standards to enhance and protect Tribal surface water quality.

It is suspected that agricultural activities in local watersheds are negatively impacting Tribal surface waters. Much of the Tribe's property is located in the Glidden Brook watershed and Hardwood Brook watershed, which is utilized intensely for agricultural purposes (see Figures 5-1 and 5-2). The potential for agricultural chemical contamination does exist and it is likely that there may already be contamination. The possible classes of contaminants are nutrients, insecticides, herbicides, and sediments (See Appendix A for more information on the Glidden Brook watershed). Additionally, an application to build an irrigation pond on Glidden Brook, immediately upstream of Tribal property, has been submitted to the Maine Department of Environmental Protection (minor flaws kept the application from being approved at this time).

At this time there is no baseline data for Tribal surface waters. Through this project, the Tribe will begin developing baseline characterization data for its surface waters. The baseline data will enable the Tribe to document water quality changes over time, screen for potential water quality problems, determine the impact of a future land use activity such as forestry or farming, and provide a scientific basis for making decisions on the management of the stream and watershed.



Source: Delorme Street Atlas USA, (1996).

FIGURE 5-1. PROJECT LOCATION, AROOSTOOK COUNTY MAINE

N W E S

Source: Photograph by James Sewall Co. (1998).

(UTM Coordinates of $\otimes \cong$ 19T, $^{5}77^{000m}$E & $^{51}82^{000m}$N)

FIGURE 5-2. AERIAL PHOTOGRAPH SHOWING WATERSHEDS, AND TRIBAL PROPERTY BOUNDARIES ——

6.0 PROJECT DESCRIPTION AND SCHEDULE

PROJECT OVERVIEW (OUTCOME OF SCOPING ACTIVITIES)

The initial water quality parameters that will be monitored include temperature, pH, dissolved oxygen, specific conductance, and flow data. In order to characterize the stream and create a baseline of data, each of these evaluations is a critical component of the overall study.

Three sites where this data will be collected have been chosen on Glidden Brook and one on Hardwood Brook. The sites are easily located on the USGS Goodwin Quadrangle and Caribou Quadrangle 7.5-minute series topographic maps. They are: (1) the intersection of Glidden Brook and Caribou/Presque Isle corporate boundary; (2) on the south side of the old bridge at the intersection of Glidden Brook and the field road crossing Tribal property east to west; (3) at the confluence of Glidden Brook with Hardwood brook (flow data taken here); and (4) a pond located on Tribal land on Hardwood Brook. A map with the locations marked is included, see Figure 10-1 for data collection locations.

DATA COLLECTION TASKS

Hand held field meters will be used to collect data in the field, making the task easy and quick. Data will be collected once a day five times a week, at the same time each day (Monday – Friday); this schedule is frequent enough to yield a good data set yet still convenient. Quality Assurance Officer Nick Archer will perform Field Sampling Technical Systems Audits; once at the onset of data collection and again during August (the August audit will be unannounced to field team).

PROJECT SCHEDULE TIMELINE TABLE

Major Task Categories	J	F	M	A	M	J	J	A	S	O	N	D
QAPP Preparation and Completion					X	X						
5x/week Temperature, pH, DO, Conductance, Flow sampling						X	X	X	X	X		
Field Sampling Technical Systems Audit						X		X				
Work Progress and Data Results (Reports)							X	X	X	X	X	

7.0 QUALITY OBJECTIVES FOR DATA MEASUREMENTS

PRECISION, ACCURACY, AND MEASUREMENT RANGE TABLE

Matrix	Parameter	Precision	Accuracy	Measurement Range
Water	Temperature	±5% RPD	±5%	-5 to +95°C
Water	pH	±5% RPD	±5%	0 to 14
Water	Dissolved Oxygen	±5% RPD	±5%	0 to 20mg/L
Water	Specific Conductance	±5% RPD	±5%	0 - 499.9 µS, 0 – 4999 µS, 0 - 49.99 mS, 0 - 200.0 mS
Water	Flow Volume	±10% RPD	±10%	Velocity Meter Range 2 cm/sec to 7.9 m/sec
Note: RPD = Relative Percent Difference				

REPRESENTATIVENESS

The data will reflect the tested physical properties of the surface water at each of the data collection sites. The sites are small and well represented by one measurement, but three measurements will be taken at each site and averaged.

COMPARABILITY

The baseline data collected will be compared to each future season's data and will be used to monitor any changes that might be occurring, the data will be compared to past studies, and to any identified local reference sites. This will be easily accomplished because the data will be collected using standardized methods, and reported using standard units.

COMPLETNESS

There is no fraction of the data that must be collected in order to fulfill statistical criteria, however the more complete the data set the more useful it will be. It is expected that not all, but greater than 90% of the data collection will be completed.

8.0 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

This project does not require uniquely trained or certified personnel to perform field reconnaissance, sampling, field or off-site analysis, data validation or any other project functions. Resume of key project staff are attached (see attachment 1).

9.0 DOCUMENTATION AND RECORDS

In the field, data will be entered into field notebooks with bound water-resistant pages, and all entries will be made with indelible ink. The information that is collected in the field will be transferred to a data form when the field team returns to the office (see example forms, Figure 9-1, 9-2, and 9-3). Data will also be recorded into a computerized database. Information that will be recorded in the field logbooks/data forms for water quality parameters includes:

- Project name;
- Water body name and type of water body;
- Site name/number, location;
- Name, title, and signature of person/persons collecting the data;
- Date, arrival time and finish time (military);
- Water depth @ measurement location and depth that measurement was taken in centimeters;
- Water appearance and odor;
- Water temperature in °C, pH in units, dissolved oxygen in mg/L, specific conductance in μS/cm;
- Weather past 24hrs. including precipitation;
- Weather current conditions, including barometric pressure, temperature, and relative humidity;
- Site observations, descriptions of activities, and other characterizing notes of site/conditions; and,
- Equipment used, and calibration date and time.

(For information that is included on the form for flow volume see example form *Discharge Data Form*).

All field logbooks and data forms will be filed by date and project name at the Environmental Health Department and stored for no less than five years. Data will also be stored on computer disk for no less than five years.

Samples will not be removed from the field; therefore no sample handling, tracking, or Chain-of-Custody systems will be necessary.

Tribal Surface Water Field Data Record Project Name______________________ Page____ Of____.

Water Body Name______________________________ Date____________.

Type of water body: ☐Stream ☐River ☐ Lake ☐ Pond ☐ Marsh ☐ Other______________.

Name & Title of Person Collecting Data______________________________________.

Site Number/Location______________________________ Time Start__________ Finish__________.

Water Depth @ Sample Location____________cm. Depth that measurement was taken____________cm

Temperature #1________°C **Replicate #1**________°C **Precision RPD**________%

Temperature #2________°C **Replicate #2**________°C **Precision RPD**________%

Temperature #3________°C **Replicate #3**________°C **Precision RPD**________%

pH #1________units **Replicate #1**________units **Precision RPD**________%

pH #2________units **Replicate #2**________units **Precision RPD**________%

pH #3________units **Replicate #3**________units **Precision RPD**________%

Dissolved Oxygen #1________mg/l **Replicate #1**________mg/l **Precision RPD**________%

Dissolved Oxygen #2________mg/l **Replicate #2**________mg/l **Precision RPD**________%

Dissolved Oxygen #3________mg/l **Replicate #3**________mg/l **Precision RPD**________%

Average temp__________°C

Average pH__________units

Average DO__________mg/L

Average SC__________µmhos/cm

Specific Conductance #1________µmhos/cm **Replicate #1**________µmhos/cm **Precision RPD**________%

Specific Conductance #2________µmhos/cm **Replicate #2**________µmhos/cm **Precision RPD**________%

Specific Conductance #3________µmhos/cm **Replicate #3**________µmhos/cm **Precision RPD**________%

Water Appearance: ☐Clear ☐Milky ☐Turbid ☐Foamy ☐Oily ☐Light/Dark Brown ☐Greenish ☐Other__________.

Water Odor: ☐None ☐Fishy ☐Chlorine ☐Sewage ☐Rotten Eggs ☐Other______________.

Weather 24hr. precip__________ Ait temp__________ Sky cond.__________ Rel Humidity__________ Barometric pres.__________.

Notes (Site Observations):

Temperature Meter Used______________________. Calibration Time (Before/After)______________. Accuracy__________%

pH Meter Used______________________. Calibration Time (Before/After)______________. Accuracy__________%

Dissolved Oxygen Meter Used______________________. Calibration Time (Before/After)______________. Accuracy__________%

Specific Conductance Meter Used______________________. Calibration Time (Before/After)______________. Accuracy__________%

Revision Number 1, 7/2/99

Discharge Data, Field Component: Water Body Name________________ Date________.

Site Number/Location____________________________.

Time Start________ Finish________. Stream stage start________ cm final________ cm

24hr. Precipitation________ cm Storm Event____ Yes____ No.

Notes:

	b_1	b_2	b_3	b_4	b_5	b_6	b_7	b_8	b_9	b_{10}	b_{11}	b_{12}	b_{13}	b_{14}	b_{15}	b_{16}	b_{17}	b_{18}	b_{19}	b_{20}
b_x																				
d_x																				
ct_s																				
ct_f																				
t_x																				
Office Completed Component																				
ct																				
v_x																				
q_x																				

TOTAL DISCHARGE = $\Sigma(q_x) =$ $\boxed{}$ $q_x = v_x[b_{(x+1)} - b_{(x-1)}/2]d_x$

When water on one side of observation point only (end points) use $q_1 = v_2[b_2 - b_1/2]d_1$ and $q_n = v_{(n-1)}[b_n - b_{(n-1)}/2]d_n$

Replicate Measurements																				
b_x																				
d_x																				
ct_s																				
ct_f																				
t_x																				
Office Completed Component																				
ct																				
v_x																				
q_x																				

TOTAL DISCHARGE = $\Sigma(q_x) =$ $\boxed{}$

b_x = distance from initial point to location x in cm, d_x = depth of water at location x in cm, ct_s = meter reading at start time, ct_f = meter reading at finish time

ct = difference in counts (meter reading start – final), t_x = elapsed time in sec, v_x = mean velocity at location x in cm/sec,

q_x = discharge through partial section x in cm^3

Atach to Field Data Form

Calibration Form

Instrument Date/Times Signature

Preuse: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Preuse: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Instrument Date/Times Signature

Preuse: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Preuse: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Instrument Date/Times Signature

Preuse: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Preuse: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Instrument Date/Times Signature

Preuse: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Preuse: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #1 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

After use: Ref. Std. #2 Meter rd. #1 #2 #3 #4 #5 #6 Accuracy %

Notes:

10 DATA COLLECTION PROCESS DESIGN

The initial water quality parameters that will be monitored include temperature, pH, dissolved oxygen, specific conductance, and flow data. In order to characterize the watershed and create a baseline of data, each of these evaluations is a critical component of the overall study.

The sites have been chosen based on their ability to be easily found, accessed, and returned to (see map of data collection locations Figure 10-1). The spacing of the sites will also show a gradient (if any) in the water quality as it crosses Tribal property. The flow measurement site has been chosen because the watershed's acreage has already been determined, the site should be indicative of the entire watershed, and the lack of water use for irrigation on this stream will yield natural flow data that can be used for neighboring watersheds/streams.

Data will be collected during all months that the surface water is not frozen starting after spring thaw; the exception is this season due to the delay in the preparation of the QAPP. Data will be collected once a day five times a week, at the same time of day (Monday – Friday); this schedule is frequent enough to yield a good data set yet still convenient. Quality Assurance Officer Nick Archer will perform Field Sampling Technical Systems Audits; once at the onset of data collection and again during August (the August audit will be unannounced to field team).

The only foreseeable constraints that might affect scheduled data collections are equipment failure and severe weather. Instrument failures (except for temperature) could prevent data from being collected, but the instruments are reliable, water proof, and brand new. Each parameter will be collected using a separate meter (except temperature); therefore, unless all meters malfunction at the same time some of the data will be collected. For safety purposes, project personnel will wait until severe weather subsides before going into the field.

Topo
Map
with Sites

11.0 SAMPLE COLLECTION METHODS REQUIREMENTS

The water quality parameters that will be monitored include temperature, pH, dissolved oxygen, specific conductance, and flow data. All data will be collected *in situ*, therefore no containers, sample preservatives, or observance of holding times will be necessary. Parameters will be analyzed with hand held field meters (see section 13 Analytical Methods Requirements for SOP references, instrument lists, and standard methods citations).

12.0 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Samples will not be removed from the field or from the water body (all measurements will be taken in-situ); therefore no sample handling, tracking, or Chain-of-Custody systems are necessary.

13.0 ANALYTICAL METHODS REQUIREMENTS

The water quality parameters that will be monitored include temperature, pH, dissolved oxygen, specific conductance, and flow data. The following is a table of parameters, analytical methods cited, the instruments used for collecting the data, and the reference number for the corresponding SOP. The attached SOPs describe in detail the procedures for collecting data, equipment use, and calibration, inspection, and maintenance of the instruments.

FIELD ANALYTICAL METHOD/SOP REFERENCE TABLE

SOP Reference Number	SOP Title, Revision Date/Revision	Analytical Parameter	Instrument Used	Standard Method Used Document Citation
F-1	Methods for Calibrating and Using Specific Conductance Meter, Revision 1	Temperature	YSI 30 Conductance Meter	EPA 841-B-97-003, *Volunteer Stream Monitoring: A Methods Manual,* 1997
F-2	Methods for Calibrating and Using pH Meter, Revision 1	pH	YSI 60 pH/ Temperature Meter	EPA 821-C-97-001, *EPA Methods And Guidance For Analysis Of Water,* Method #: 150.1, 1997
F-3	Methods for Calibrating and Using Dissolved Oxygen Meter Revision 1	Dissolved Oxygen	YSI 58 Dissolved Oxygen Meter	EPA 841-B-97-003, *Volunteer Stream Monitoring: A Methods Manual,* 1997
F-1	Methods for Calibrating and Using Specific Conductance Meter, Revision 1	Specific Conductance	YSI 30 Conductance Meter	EPA 841-B-97-003, *Volunteer Stream Monitoring: A Methods Manual,* 1997
F-4	Methods for Making Discharge Measurements	Volume of Stream Flow	GO #2030 Flowmeter	Buchanan T. J., and W. P. Somers. *Techniques of Water-Resources Investigations of the United States Geological Survey, Discharge Measurements at Gaging Stations,* Book 3, Chapter A8, 1969.

14.0 QUALITY CONTROL REQUIREMENTS

All parameters will be analyzed *in situ* by hand held field instruments; no outside laboratory, field laboratory, or any out-of-stream analyses will be conducted. Quality control consists of all instruments being calibrated to National Institute of Standards and Technology (NIST) traceable standard solutions before and after field use (except for flow meter), and replicate measurements for all parameters each time a measurement is performed. Additionally, the Technical Director/QA Officer *(Fred Corey)* will randomly audit project procedures while being performed to insure that the procedures are conducted in accordance with SOPs.

15.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

All instruments/equipment will be inspected and tested each day before being taken into the field. All instrument maintenance will be performed according to the manufacturer's recommendations and will be recorded by the Project Manager in a maintenance logbook. All records and instruments/equipment will be stored at the Environmental Health Office.

16.0 INSTRUMENT CALIBRATION AND FREQUENCY

Instruments will be calibrated and the accuracy verified before and after each field use (except for flow meter), following the manufacturer's calibration instructions (calibration procedures are outlined in the SOPs for each instrument). The following is a list of the standards or certified equipment that will be used to calibrate instruments:

- Thermometer: –8 to 32°C (1/10°C increments), has a NIST traceable certificate;
- pH buffers: pH 4.01, pH 7.00, and pH 10.00, all standardized against NIST-certified pH references within 0.01 pH at 25°C;
- Dissolved Oxygen: 0mg/L solution, and water saturated air solution;
- Conductivity solutions: 70μS/cm, and 700μS/cm, certified traceable to NIST standards.

The Flowmeter used is a General Oceanic model 2030R, and its calibration is verified by comparison to a known flow: (1) weakly to a Parshall flume at the Presque Isle sewage treatment plant, and (2) monthly to a meter of confirmed calibration during field system audit by David Miller of Maine DEP.

17.0 INSPECTION AND ACCEPTANCE REQUIREMENTS FOR SUPPLIES

All supplies will be purchased from a reputable laboratory supplier and inspected for defects (i.e., broken containers or seals, expiration dates, etc.) upon receipt. All serial numbers will be checked and compared to certificates. All supplies/instruments/equipment will be inspected and tested during field audits using instruments provided by QA Officer Nick Archer of MDEP. Any materials not conforming to the quality standards the product was intended to possess will be sent back to the supplier.

18.0 DATA ACQUISITION REQUIREMENTS

No past water quality studies on this watershed can be found, but some project data will be acquired from other sources. The following is a list/use of this data and the source:

- USGS 7.5 minute topographic maps, Site locations, project boundaries, United States Geological Survey;
- Annual weather summaries, local climatological data for Caribou Maine, National Oceanic and Atmospheric Administration;
- Report titled *Data for Watershed Restoration Priority 2/5/99*, for watershed boundaries and acreage, Skip Babineau - Natural Resources Conservation Service;
- Soil Survey Aroostook County, Maine Northeastern Part, for familiarization/background, United States Department of Agriculture; and,
- Descriptions of wildlife habitat, for familiarization/background, Maine Dept. of Inland Fisheries & wildlife.

The above listed data will not be used in any way that will affect the quality of the data that will be collected during this project.

Limitations:

The climatological data is collected by the National Weather Service at the Caribou city airport approximately 6 miles north of the project site, and may not reflect actual conditions at the project site.

The watershed boundaries/acreage will need to be verified, if the flow data is to be expressed in terms of the drainage area i.e., CFSM (cubic feet per second per square mile of drainage area). This project expresses flow in terms that are unrelated to acreage i.e., m^3/sec.

19.0 DATA MANAGEMENT

All field logbooks will contain a sequential list of data/information that must be included in the logbook before leaving each site. The individual collecting the data (usually the Project Manager/Field Supervisor) will sign the logbook entry for each site after verifying all items have been completed. Upon returning to the office the data collector will transcribe site data onto field forms (see forms § 9.0). The Technical Director/QA Officer *(Fred Corey)* will review the field forms daily for completion and initial and date the form. The Project Manager/Field Supervisor (David Macek) will, each week, enter all data into a computerized spreadsheet/database "Microsoft Excel".

Summary reports, including field forms and spreadsheets, will be submitted to the Technical Director/QA Officer *(Fred Corey)* each month for review. If errors are detected in any data entries or in the reports, the Project Manager/Field Supervisor (David Macek) will re-enter the data and make corrections to the report.

20.0 ASSESSMENTS AND RESPONSE ACTIONS

QA Officer Nick Archer of MDEP will initially evaluate the performance of field personnel at the onset of data collection, and any necessary corrections in procedures will be made at this time. The Technical Director/QA Officer *(Fred Corey)* will randomly conduct audits of data collection in the field to insure that all procedures are followed according to the SOPs, and immediately make corrections if necessary.

All data will be evaluated daily for quality and compared to the project quality objectives by calculating precision (using the replicate measurements) and accuracy (using calibration measurements). This will be performed when the data is being transcribed onto field forms by the Project Manager/Field Supervisor (David Macek). Any data that does not meet the project quality objectives will be re-collected, if possible, the same day after correcting the issue that caused the data quality problem.

21.0 REPORTS

Progress reports containing data results, interpretation of the results, work progress, results of QC audits, and a list of corrections (if any), will be produced monthly. A summary of all reports will be submitted quarterly to the EPA Approval Authority along with other regularly scheduled environmental reports.

All reports or data will be made available to any interested organizations/individuals subject to Tribal approval.

22.0 DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS

All data will be reviewed daily by the Project Manager/Field Supervisor (David Macek), and any data that does not meet project quality objectives will be re-collected if possible, at that time. In addition, the Technical Director/QA Officer *(Fred Corey)* will review data and reports for project quality objectives monthly and any data that does not meet objectives will be flagged appropriately.

23.0 VALIDATION AND VERIFICATION METHODS

The Project Manager/Field Supervisor (David Macek) will perform these procedures to insure validity of data before data is transcribed to field data forms:

- At each site each parameter is measured three times, at no less than 1 meter apart, and averaged to insure representativeness;
- All measurements are replicated in the field each time a measurement is made;

- Each day the data will be transcribed to the *Field Data Record form,* and checked for errors and completeness, then submitted to the Technical Director/QA Officer *(Fred Corey)* for his inspection and approval.
- Each day, while data is being transcribed, data is evaluated for precision using the relative percent difference of field replications;
- The equipment is evaluated for accuracy by calibrating to standards and replicating the measurements of the standards; and,

Monthly spreadsheets and all field data forms are presented to the Technical Director/QA Officer *(Fred Corey)* who compares them for accuracy, verifies calculations, equipment calibration, and completeness; and directs the Project Manager/Field Supervisor (David Macek) to correct any errors.

24.0 RECONCILIATION WITH DATA QUALITY OBJECTIVIES

All data will be evaluated daily for quality and compared to the project quality objectives by calculating precision (using the replicate measurements) and accuracy (using calibration measurements). This will be performed when the data is being transcribed onto field forms by the Project Manager/Field Supervisor (David Macek). Any data that does not meet the project quality objectives will be re-collected, if possible, the same day after correcting the issue that caused the data quality problem. Representativeness, completeness, and comparability will be calculated, evaluated, and compared to project quality objectives.

If data quality indicators do not meet the project specifications, data will be discarded or flagged for limited use and further review, and any limitations will be detailed in reports.

If failure to meet project specifications occurs, the cause of the failure will be evaluated and corrected.

STANDARD OPERATING PROCEDURES (F-1), METHODS FOR CALIBRATING AND USING THE YSI 30 SPECIFIC CONDUCTIVITY/TEMPERATURE METER

CALIBRATION

Systems calibration is rarely required because of the factory calibration of the YSI model 30, and should only be performed when necessary.

1. Perform calibration as close to 25°C as possible.
2. Turn the instrument on and allow it to complete its self-test procedure.
3. Use clean, properly stored standard solution (either 70 or 700µS/cm) that has the closer specific conductivity as the sample that will be measured.
4. Place at least 3 inches of solution in a clean (see Container Cleaning section 4) glass beaker.
5. Insert the probe into the beaker deep enough to completely cover the entire conductivity cell (do not let the probe rest on the bottom of the container), and gently agitate to remove any bubbles in the conductivity cell.
6. Press the **MODE** key until the instrument is reading specific conductance.
7. ~~Allow at least 60 seconds for the temperature reading to become stable.~~
8. Press and release both the **UP ARROW** and the **DOWN ARROW** keys at the same time. The **CAL** symbol will appear at the bottom left of the display to indicate that the instrument is now in Calibration mode.
9. Use the **UP ARROW** or the **DOWN ARROW** key to adjust the reading on the display until it matches the value of the calibration solution you are using.
10. Once the display reads the exact value of the calibration solution being used press the **ENTER** key. The word "**SAVE**" will flash across the display for a second indicating that the calibration has been accepted.

VERIFICATION OF CALIBRATION AND ACCURACY

It is required that the calibration is verified and the times recorded before and after each field use.

For Specific conductivity

1. In the lab, record date and time on a Calibration Form
2. Use clean, properly stored, 70µS/cm standard solution; record this value on Calibration Form in Preuse Ref. Std. #1 location. Place at least 3 inches of solution in a clean glass beaker.
3. Turn the instrument on and allow it to complete its self-test procedure. Make certain that the meter is in Specific Conductance Mode and use Autoranging.

4. Insert the probe into the beaker deep enough to completely cover the entire conductivity cell (do not let the probe rest on the bottom of the container), and gently agitate to remove any bubbles in the conductivity cell.
5. Following the ***METER USE*** procedures of this SOP; measure the standard (as close to 25°C as possible) and record the measurement and temperature on the Calibration Form in the appropriate location (i.e., Preuse/After use), repeat the measurement 5 more times, calculate the accuracy (% Accuracy = [average value – true value/true value]100) and record the accuracy on the form.
6. Rinse the probe with deionized water (and wipe dry) between changes of calibration solutions.
7. Repeat the above procedure using clean, 700µS/cm standard solution and record this on form in Preuse Ref. Std. #2 location.
8. If the accuracy is ±5% or less it can be used in the field, if the accuracy is greater than ±5% perform the calibration section of this SOP and repeat verification.

For temperature

1. Place the instrument probe and the certified calibration thermometer into a container and fill with room temperature water (cover the thermometer completely).
2. Allow plenty of time (approximately 3 minutes) for both the thermometer and probe to ~~equilibrate. Record the true temperature (calibration thermometer value) on the form in the~~ appropriate location (i.e., Preuse/After use) as Ref. Std #1. Record the instrument's measurement on the Calibration Form, then repeat the instrument measurement 5 more times, calculate the accuracy and record this value on the form (% Accuracy = [average value – true value/true value]100).
3. Place excess ice into the container with the thermometer and probe and allow plenty of time (approximately 3 minutes) for both the thermometer and probe to equilibrate.
4. Repeat step 2 above but record as Ref, Std. #2 on the Calibration Form
5. If the accuracy is ±5% or less it can be used in the field, if the accuracy is greater than ±5% the meter must be serviced.

METER USE, *Field Collection Requirements and Meter Use Instructions*

Field Collection Requirements

It is required:

1. **At each site three measurements of each (specific conductivity and temperature) are taken at a distance of not less than one meter apart (to better represent the site).**
2. **Each of the three measurements is to be replicated (to calculate precision).** The probe will be removed from the sample/stream completely (approximately 15 seconds), then reinserted for a second reading.

Meter Use Instructions

1. Turn the instrument on and allow it to complete its self-test procedure.

2. Select **Specific Conductance** mode; to change between modes, press and release the **MODE** key. For the most accurate measurements use autoranging (this is on automatically); **rANG** will flash on the display to indicate the meter is autoranging when the probe is first placed into a sample.
3. To take a measurement, simply insert the probe into the liquid sample about which you would like to receive information. Be sure to insert the probe into the sample deep enough to completely cover the entire conductivity cell (do not let the probe touch any solid object while you are taking a reading this may effect the reading slightly) and gently agitate to remove any bubbles in the conductivity cell.
4. Allow the probe to stabilize in regards to the sample temperature (approximately 60 seconds) before proceeding.
5. The Specific Conductivity can be recorded into the field logbook (using µS/cm).
6. The temperature can be recorded into the field logbook (use °C).
7. Always store the probe in the storage chamber built into the instrument's side

CONTAINER CLEANING

Wear latex gloves

1. Wash each sample bottle or piece of glassware with a brush and phosphate-free detergent.
2. Rinse three times with cold tap water.
3. Rinse three times with distilled or deionized water.

STANDARD OPERATING PROCEDURES (F-2), METHODS FOR CALIBRATING AND USING THE YSI 60 pH/TEMPERATURE METER

CALIBRATION

Systems calibration is required before each use. Calibration procedures will follow the 2-points calibration method using buffers that encompass the pH of the sample (this will be 4.01 and 7.00 buffers or 7.00 and 10.00 buffers).

1. In the lab, record date and time on a Calibration Form
2. Use clean, properly stored, pH 7 standard buffer solution, record this value on Calibration Form in Preuse Ref. Std. #1 location. Place 35mL of the buffer solution into a clean (see Container Cleaning) 100mL graduated cylinder.
3. Turn the instrument on by pressing the **ON/OFF** key, and then press the **MODE** key until pH is displayed.
4. Rinse the probe with deionized or distilled water, then carefully dry the probe (or rinse it with some of the pH buffer solution to be used for calibration).
5. Immerse the probe making sure that both the pH and temperature sensors are covered by the buffer solution. Calibrate as close as possible to the sample temperature, and always give the pH and temperature sensors enough time to equilibrate with the temperature of the buffer (if after long storage in pH 4 KCI solution allow 5 minutes)
6. Press the **UP** and **DOWN ARROW** keys simultaneously to enter the calibration menu. The display will show the buffer to be used **7.00**, **CAL** at the bottom center, and **STAND** will be flashing at the lower left.
7. Press **ENTER** key, **STAND** will stop flashing and the decimal point in the pH **7.00** will be flashing.
8. When the decimal point stops flashing (the reading is stable) press and hold the **ENTER** key to save the calibration point (the model 60 will flash **SAVE** on the display along with **OFS** to indicate that the offset value has been saved). **SLOPE** will now appear on the display and be flashing.
9. Rinse the probe with deionized or distilled water, then carefully dry the probe (or rinse it with some of the pH buffer solution to be used for calibration).
10. Use clean, properly stored, pH 4.01 standard buffer solution, record this value on Calibration Form in Preuse Ref. Std. #2 location. Place 35mL of the buffer solution into a clean (see instructions for cleaning) 100mL graduated cylinder.
11. Immerse the probe making sure that both the pH and temperature sensors are covered by the buffer solution. Calibrate as close as possible to the sample temperature, and always give the pH and temperature sensors enough time to equilibrate with the temperature of the buffer.
12. Press the **ENTER** key; **SLOPE** will stop flashing and the buffer solutions value will be displayed with a decimal point to its left flashing

13. When the decimal point stops flashing (the reading is stable) press and hold the **ENTER** key to save the calibration point (the model 60 will flash **SAVE** on the display along with **SLP** to indicate that the slope value has been saved). **SLOPE** will now appear on the display and be flashing.
14. Press the **MODE** key to return to normal operation; the system is now calibrated.

VERIFICATION OF CALIBRATION AND ACCURACY

It is required that the calibration is verified and the time is recorded before and after each field use. Verification of calibration and accuracy procedures will be performed at 2-points using buffers that encompass the pH of the sample (in most cases this will be 4.01 and 7 buffers).

1. Following the meter use procedures of this SOP measure the pH 7 buffer solution (as close to the sample temperature as possible) and record the measurement and temperature on the Calibration Form in the appropriate location (i.e., Preuse/After use). Repeat the measurement 5 more times, calculate the accuracy and record the accuracy on the form (% Accuracy = [average value – true value/true value]100).
2. Rinse the probe with deionized or distilled water, then carefully dry the probe (or rinse it with some of the pH buffer solution to be used for calibration).
3. ~~Repeat procedure 1 (of this section) using clean, pH 4.01 buffer solution.~~
4. If the accuracy is ±5% or less it can be used in the field, if the accuracy is greater than ±5% perform the calibration section of this SOP and repeat verification.

METER USE, *Field Collection Requirements and Meter Use Instructions*

Field Collection Requirements

It is required:

1. **At each site three measurements are taken at a distance of not less than one meter apart (to better represent the site).**
2. **Each of the three measurements is to be replicated (to calculate precision).** The probe will be removed from the sample/stream completely (approximately 15 seconds), then reinserted for a second reading.

Meter Use Instructions

1. To take a measurement, simply insert the probe into the liquid sample about which you would like to receive information. Be sure to insert the probe into the sample deep enough so that both the pH and temperature sensors are covered. Gently agitate to remove any trapped air bubbles.
2. Allow the probe to stabilize in regards to the sample temperature (approximately 60 seconds) before proceeding.
3. The pH can be recorded into the field logbook (in units).

4. Always store the probe in the storage chamber built into the instrument's side while using in the field.

CONTAINER CLEANING

Wear latex gloves

1.0 Wash each sample bottle or piece of glassware with a brush and phosphate-free detergent.

2.0 Rinse three times with cold tap water.

3.0 Rinse three times with distilled or deionized water.

STANDARD OPERATING PROCEDURES (F-3), METHODS FOR CALIBRATING AND USING THE YSI 58 DISSOLVED OXYGEN METER

CALIBRATION

Systems calibration is required before each use. Calibration procedures will follow the Air Calibration methods recommended by the manufacturer.

1. In the lab, record date and time on a Calibration Form. Inspect the meter and probe; paying particular attention to the probes membrane. If the membrane has any wrinkles, leaks, bubbles, or if the electrolyte is dried out, replace the membrane following instructions in the operation manual.
2. Set the function switch to **% Mode.**
3. Place a wet sponge or a piece of cloth in the plastic calibration bottle. Slip the probe into the bottle. Wrap the probe and calibration bottle in a large wet cloth (as close to the sample temperature as possible) to insulate it from temperature changes.
4. Set the function switch to **ZERO** and readjust the display to read **0.00**. Switch back to **% Mode,** and allow enough time for the display to stabilize.
5. Using the local altitude or the true atmospheric pressure determine the correct calibration value from the pressure/altitude chart in Appendix F of the operation manual.
6. When the display reading has stabilized, unlock the **02 CALIB** control locking ring and adjust the display to the calibration value obtained from the chart in step 5. Relock the locking ring to prevent inadvertent changes.

VERIFICATION OF CALIBRATION AND ACCURACY

It is required that the calibration is verified and the time is recorded before and after each field use. Verification of calibration and accuracy procedures will be performed using a solution of zero dissolved oxygen.

1. Add excess sodium sulfite (Na_2SO_3) and a trace of cobalt chloride ($CoCl_2$) to bring DO to zero.
2. Following the meter use procedures of this SOP, measure the dissolved oxygen of the solution (as close to the sample temperature as possible) and record the measurement on the Calibration Form in the appropriate location (i.e., Preuse/After use). Repeat the measurement 5 more times, calculate the accuracy and record the accuracy on the form (% Accuracy = [average value – true value/true value]100).
3. If the accuracy is ±5% or less it can be used in the field, if the accuracy is greater than ±5% perform the calibration section of this SOP and repeat verification.

METER USE, *Field Collection Requirements and Meter Use Instructions*

Field Collection Requirements

It is required:

1.0 At each site three measurements are taken at a distance of not less than one meter apart (to better represent the site).

2.0 Each of the three measurements is to be replicated (to calculate precision). The probe will be removed from the sample/stream completely (approximately 15 seconds), then reinserted for a second reading.

Meter Use Instructions

1. Adjust the **SALINITY** control to the salinity of the sample (assumed to be zero).
2. To take a measurement, simply insert the probe into the liquid sample about which you would like to receive information. Be sure to insert the probe into the sample deep enough so that the sensors are completely covered. Move the probe in the water at a rate of at least one-foot per second, continuously, while measurement is being made.
3. Turn the function switch to **02 ZERO** and readjust if necessary.
4. Turn the function switch to **mg/L mode** and read the dissolved oxygen value.
5. The dissolved oxygen value can be recorded into the field logbook (use mg/L).

STANDARD OPERATING PROCEDURES (F4), METHODS FOR MAKING DISCHARGE MEASUREMENTS

MAKING DISCHARGE MEASUREMENTS

1. Record the time, date, site number, and stream stage at the measurement site in the field logbook before proceeding with the discharge measurements.
2. Always use the exact same site each time measurements are taken. Make sure site flagging is clearly marking the site.
3. If using the GO 2030R flow meter, define partial sections as per USGS method (Buchanan and Somers, 1969). Make discharge measurements using the USGS *Six-tenths-depth-method* (Buchanan and Somers, 1969).
4. Use USGS *Volumetric methods* if flow is too low for flow meter.
5. When discharge measurements are complete record the stream stage (in centimeters) and time in the field logbook then sign the entry.

USING THE GO 2030R FLOW METER

1.0 Record the starting odometer reading (ct_s) then place the meter into the water 0.6 of d_x from surface (wading rod is marked in cm), time the duration the meter is in the water, record the time and final odometer reading (ct_f) in the field logbook.

2.0 Perform all discharge measurements twice and calculate precision. Repeat procedure if RPD is greater than 10%.

Calibration

The user can not calibrate the GO 2030R, flow meter. Follow the maintenance instructions in the operators manual to guarantee problem free service. If problems should arise, contact the manufacture for recommendations.

Verification of calibration and accuracy

It is required that the GO 2030R flow meter is compared to a known flow (the Presque Isle sewage treatment plant) weekly to assure proper functioning. Additionally, the meter will be field checked and the systems audited monthly by David Miller of the State of Maine Department of Environmental Protection.

Weekly

1. Using the USGS *Six-tenths-depth-method* (Buchanan and Somers, 1969) measure the flow (twice) in the straight run just ahead of the Parshall flume at the PI sewage treatment plant. Calculate the precision and accuracy.
2. If the precision/accuracy is below ±10% the meter can be used. If greater than 10% the reasons must be identified and corrected if possible. Flag all data that may be outside of the 10% range.

Monthly

1. As per arrangements with David Miller, perform USGS *Six-tenths-depth-method* (Buchanan and Somers, 1969) measurements on a stream, with David Miller simultaneously, using a meter of known accuracy, and compare measurements. Calculate the accuracy.
2. If the accuracy is below ±10% the meter can be used. If greater than 10% the reasons must be identified and corrected if possible. Flag all data that may be outside of the 10% range.

VOLUMETRIC METHOD

1. If the GO 2030R meter fails to be sensitive to the lowest flows then use sand bags to channel flow and create a small fall in which to observe the time required to fill a container of known volume (Buchanan and Somers, 1969).

APPENDIX A, GLIDDEN BROOK

The Aroostook Band of Micmacs
Data For Watershed Restoration Priority 2/5/99
Skip Babineau - Natural Resources Conservation Service

The Glidden/Hardwood Brook watershed falls within the 14 digit HUC 01010004120090 and is proposed as a priority watershed most in need of restoration and protection through the year 2000. It is a sub-watershed of the Aroostook River watershed, HUC 01010004, which is a category 1 watershed.

The size of the Glidden/Hardwood Brook watershed is 3950 total acres. Of that total, 95 acres is residential, 1000 acres is grassland, 1330 acres is woodland and 1525 acres is rowcropped land. This high concentration of rowcropped land in the watershed has an excessive sheet and rill erosion rate of 6 tons of soil loss per acre per year. Ephemeral gully erosion is between 2 and 7 tons per acre per year. Improper management of woodland has lead to forestland erosion. Nutrients utilized for crop production have the potential to leach into groundwater and to enter surface water through overland flow and erosion. Pesticides, which are utilized for crop production, also have the potential to enter both groundwater and surface water. With both Glidden Brook and Hardwood Brook flowing directly through Micmac Tribal lands the potential impacts of non-point source pollution from the sources outlined above on Tribal lands is significant. In addition, the city of Caribou uses the Aroostook River as its public water supply. The intake of that supply lies a short distance downstream from where the Glidden/Hardwood Brook outlets into the Aroostook River.

The watershed falls within what the Maine State Technical Committee has determined to be an Environmental Quality Incentives Program (EQIP) priority area. There are four resource concerns to be addressed in the EQIP priority area. The first is soil quality which includes increasing soil organic matter by 10% and eliminating excessive phosphorus and potassium in all fields. The next resource concern is the utilization of agricultural residuals on 50% of the farms. The third resource concern is water quality with a reduction of soil erosion to tolerable limits on 25% of crop fields. And the final resource concern is sustainability and profitability through a reduction of soil erosion to tolerable limits on 25% of crop fields, a 100% increase in the number of forest management plans and improved pasture management on 500 acres.

In addition to falling within an EQIP priority area the watershed lies within Maine's only Conservation Reserve Program (CRP) water quality priority area. After a review of the Maine Department of Environmental Protections non-point source priority watersheds list and consideration of where agricultural contributions were most likely to occur, the USDA Farm Service Agency state committee delineated the watersheds of Eastern Aroostook County were as the only state water quality priority area for CRP. Acreage being offered for CRP in the water quality priority area receive additional environmental benefit index points from reduced erosion, runoff and leaching.

The use of best management practices (BMP's) would greatly reduce the risk of adverse impacts on Tribal lands and the city of Caribou's public water supply due to non-point source pollution. Likely BMP's that would be implemented to reduce that risk would include grass and stonelined waterways to safely convey surface water and terraces and diversions installed across steep slopes to carry excess water to those waterways. Conservation crop rotations, stripcropping, wintercover crops and residue management are examples of BMP's which would also aid in the reduction of soil erosion. To minimize the entry of nutrients to surface and groundwater the nutrient management BMP would be utilized which manages the amount, form, placement and timing of applications of plant nutrients. To reduce adverse effects of pesticides on environmental resources, plant growth and crop production the pest management BMP would be employed. Forestland erosion control is a BMP commonly implemented to reduce erosion periodically associated with woodlot management.

With a significant acceptance and implementation of BMP's by landowners in the relatively small Glidden/Hardwood Brook watershed a measurable improvement in the water quality entering Tribal lands and the Aroostook River should be expected.